

REMARKS/ARGUMENTS

This reply is fully responsive to the Office Action dated 10 AUGUST 2007, and is filed within five - (5) months following the mailing date of the Office Action. The

5 Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136(a) requesting an extension of time of the number of months necessary to make this response timely filed. The method of payment and fees for petition fee due in connection therewith is enclosed.

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Disclosure/Claims Status Summary:

This application has been carefully reviewed in light of the Office Action of August 10, 2007, wherein:

A. Claims 1, 2, 4-8, and 11-14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,198,677, issued to Leung et al. (hereinafter referred to as the “Leung-I patent”), in view of U.S. Patent No. 4,481,062, issued to Kaufman (hereinafter referred to as the “Kaufman patent”), and in further view of U.S. Patent No. 5,587,226, issued to Leung et al. (hereinafter referred to as the “Leung-II patent”), and taken in further view of U.S. Patent No. 6,545,420, issued to Collins et al. (hereinafter referred to as the “Collins patent”) or U.S. Patent No. 6,016,036, issued to Brailove (hereinafter referred to as the “Brailove patent”);

15 B. Claims 3 and 9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Leung-I patent, in view of the Kaufman and Leung-II patents, and in further view of the Collins or Brailove patents, and taken in further view of U.S. Patent No. 5,365,070, issued to Anderson et al., hereinafter referred to as the “Anderson patent”); and

20 C. Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the Leung-I patent, in view of the Kaufman and Leung-II patents, and in further view of the Collins or Brailove patents, and taken in further view of U.S. Patent No. 4,483,737, issued to Mantei et al., (hereinafter referred to as the “Mantei patent”).

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Corrections to the Drawings

While reviewing the patent application and the drawings for the present invention, the Applicants found a small oversight on figures 1 and 2 of the present invention, where the DC power source (referring to element 118 on figures 1 and 2) has its negative terminal correctly connected to the electron source filament (referring to element 112 on figures 1 and 2) while the positive terminal of the DC power source is not illustrated as being fully connected to the outside wall of the magnetic cylinder (referring to element 110 on figures 1 and 2).

5 Therefore, the Applicants have corrected figures 1 and 2 by completing the missing connection of the positive terminal of the DC power source to the magnetic cylinder. The support for the corrections to figures 1 and 2 is found in the specification on page 13, lines 6 and 7, where the specification clearly states that "a DC power source located outside the magnetic cylinder, and connected between the electron source filament and the

10 magnetic cylinder."

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In accordance, the Applicants are currently submitting replacement sheets for all the drawings of the present invention, and request that the Examiner enter these replacement sheets and replace all prior versions, and sheets, of the drawings in the application.

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Claim Rejections - 35 U.S.C. § 103(a)

A. Turning now to the Office Action, the Examiner rejected Claims 1, 2, 4-8, and 11-14 under 35 U.S.C. § 103(a) as being unpatentable over the Leung-I patent, in view of the Kaufman patent, and further in view of the Leung II patent, and taken in further view of the Collins patent or the Brailove patent.

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Claims 1 and 7

The Examiner rejected independent Claims 1 and 7 as being obvious over the Leung-I patent, in view of the Kaufman patent, and further in view of the Leung II patent, and

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taken in further view of the Collins patent or the Brailove patent. However, upon reviewing the Collins patent and the Brailove patent in conjunction with the Leung-I, Leung-II, and Kaufman patents, the Applicants believe that: (I) the combination of the Leung-I patent with the Leung-II patent, the Kaufman patent, and the Collins patent or
5 the Brailove patent does not disclose each element disclosed by the independent Claims 1 and 7, and (II) the present invention provides an apparatus which presents a solution to an unsolved need in a crowded art, and as such, the present invention should be regarded as significant and thus, non obvious.

10 I. **All elements are not suggested by the reference teachings.**

The cited prior art does not establish a prima facie case of obviousness

In order to establish a *prima facie* case of obviousness, the Examiner must set forth an argument that provides (1) one or more references (2) that were available to the inventor
15 and (3) that teach (4) a suggestion to combine or modify the references, (5) the combination or modification of which would appear to be sufficient to have made the claimed invention obvious to one of ordinary skill in the art. Importantly, the teaching or suggestion to make the claimed combination must be found in the prior art, not in the Applicant's disclosure. *In re Vaeck*, 947 F.2d 4888, 20 USPQ2d 1438 (Fed. Cir. 1991).

20 Further, the CCPA has subsequently added that the *prima facie* case requires that the reference teachings "appear to have suggested the claimed subject matter." *In re Rinehart*, 531 F.2d 1048 (C.C.P.A. 1976).

The Applicants believe that the Examiner has failed to properly cite and establish
25 references that, if combined, teach each of the structural elements of the claimed invention. More specifically, the cited prior art fails to teach the structural element of an oxygen plasma producing element for producing oxygen plasma with atomic oxygen ions having energies less than 100eV (emphasis added), as recited in the currently amended independent Claims 1 and 7 of the present invention.

(i) Regarding “an oxygen plasma producing element for producing oxygen plasma with atomic oxygen ions having energies less than 100eV”

The Applicants refer the Examiner to the newly amended Claims 1 and 7. The amendment to this structural element is supported by the language in the specification

5 and has an acceptable meaning of the disclosure (referring to the “oxygen plasma producing element for producing oxygen plasma with atomic oxygen ions having energies less than 100eV”). These amendments are simply additional specific statements of inventive concepts described in the application as originally filed.

10 The Applicants submit that support for the current amendments to Claims 1 and 7 can be found in the original patent application on page 8, line 20 to page 9, line 2, where the specification states that “because the atomic oxygen ions (emphasis added) simply diffuse from the plasma source (emphasis added), the energies of these ions are largely dependent on collision effects, which are controlled primarily by gas diffusion and

15 pressure gradients. As a result, the atomic ions in the plasma plume have energies less than about 100 eV (emphasis added), rendering them well-suited to chemically etch a diamond sample.” Thus, the specification supports the use of an “oxygen plasma producing element for producing oxygen plasma with atomic oxygen ions having energies less than 100eV.” The Applicants respectfully request that the Examiner accept

20 the newly amended set of claims as a replacement for the previously submitted set of claims submitted with the previous Office Action response.

In light of the current amendments to Claims 1 and 7, the Applicants respectfully submit that, in contrast to the present invention, the combination of the Leung-I patent with the
25 Kaufman patent, the Leung-II patent, the Collins patent, and the Brailove patent never discloses or even suggests an “oxygen plasma producing element for producing oxygen plasma with atomic oxygen ions having energies less than 100eV.” The Applicants refer the Examiner to the statements above regarding the language in the specification supporting the production of oxygen plasma with atomic oxygen ions having energies
30 less than 100eV.

The Applicants respectfully request that the Examiner indicate exactly where, in the prior art, the Examiner finds an oxygen plasma producing element for producing oxygen plasma with atomic oxygen ions having energies less than 100eV. As shall be readily apparent, the cited prior art does not teach, suggest, or otherwise disclose this element.

Therefore, the Applicants submit that the combination of the Leung-I patent with the Kaufman patent, the Leung-II patent, the Collins patent, and the Brailove patent, in combination with the knowledge of one skilled in the art, does not teach, disclose, or suggest all of the limitations of Claims 1 and 7.

II. The present invention provides an apparatus which presents a solution to an unsolved need in a crowded art

15 The present invention provides an apparatus which presents a solution to an unsolved need in a crowded art, and as such, the present invention should be regarded as significant and thus, non obvious.

The court has ruled that improvements on crowded prior art are patentable. *Berkely Park Clothes, Inc. v. Firma Shaeffer-Homberg GMBH*, 217 U.S.P.Q. (BNA) 388 (1981). In addressing such an issue, the court stated that “like many inventions, the new design is not an astonishing breakthrough or a new technology. Nevertheless, it is a significant non-obvious improvement on prior art. Sometimes achievement is revolutionary, but more often an inventor begins where others leave off and perceives the vital forward step to which predecessors have been blind. The courts must take care to not conclude that an innovation is obvious because it has become obvious by hindsight.” *Berkely Park Clothes, Inc. v. Firma Shaeffer-Homberg GMBH*, 217 U.S.P.Q. (BNA) 388 (1981). The patent at issue in *Berkely*, U.S. Patent No. 3,872,554, was a closure for clothing in an area of crowded prior art. The court addressed the crowded art issue specifically, stating that “the field is a crowded field. It is an old field..... The non-obviousness is shown rather

dramatically by the rather surprising list of earlier patents of closures of this type, none of which approach this one in its conception.” See *Berkely* (emphasis added).

The Applicants submit that the present invention provides an apparatus which

5 presents a solution to an unsolved need in a crowded art, and as such, the present invention should be regarded as significant and thus, non obvious. The present invention is classified in the crowded art of optical quality diamond polishing.

Specifically, the present invention relates to the use of plasma-enhanced chemical etching techniques for polishing a synthetic diamond to an optical quality surface

10 (referring to the present invention, page 1, line 10, and Claims 1 and 7). In the crowded art of optical quality diamond polishing, there are several apparatus to polish diamonds to optical quality, however they require repetitive ion implantation and high ion energies, which can result in directional sputtering on the diamond’s surface (referring to the present invention, page 2). In addition, the

15 repeated scanning of the beam over a diamond sample is a slow and expensive process. In contrast, the present invention provides an apparatus for rapid, uniform, safe, and cost-effective synthetic diamond polishing (referring to present invention, pages 3-10, Claims 1 and 7, Figures 1, 2, and 5) by generating high concentrations of low energy atomic oxygen ions over a large surface area. The

20 diamond is quickly and uniformly polished by placing (positioning) the diamond in the path of the oxygen plasma exiting through the plasma source exit of the invention, and by keeping the diamond in the path of the oxygen plasma until the surface of the diamond sample has optical quality smoothness. Furthermore, the oxygen plasma producing element disclosed in Claims 1 and 7 can operate at

25 lower voltages than apparatus for ion implantation, thereby reducing both capital investment and safety concerns. Moreover, because the oxygen plasma producing element of the present apparatus generates a large plume of oxygen plasma, large diamond samples can be polished in their entirety without beam scanning. Thus, multiple samples can be polished simultaneously and quickly.

As in the case of *Berkely*, the present invention is in a crowded field, where the non-obviousness can be shown by the rather surprising list of earlier patents, none of which approach the present application in its conception. As was the case in *Berkely*, the Applicants believe that the present improvement may not be revolutionary, but it is a significant non-obvious improvement on prior art.

5 Therefore, the Applicants submit that the present invention should be regarded as significant and thus, non obvious, since the court has ruled that improvements on a crowded art such as optical quality diamond polishing are patentable, and since the
10 present invention provides an apparatus which present a solution to an unsolved need (referring to the present invention's apparatus for rapid, uniform, safe, and cost-effective synthetic diamond polishing) in the crowded art of optical quality diamond polishing.

In light of the amendments made above and for at least the foregoing reasons, the
15 Applicants respectfully submit that independent Claims 1 and 7, as written, are patentable over the combination of prior art references and respectfully request that this rejection of Claims 1 and 7 under 35 U.S.C. §103(a) be withdrawn.

New Claims 17 and 18

20 New Claims 17 and 18 have been added. These new claims disclose the limitation of “a positioning device,” where this “positioning device” is currently being removed from independent Claims 1 and 7 and is currently reintroduced into these new dependent Claims 17 and 18. Support for new Claims 17 and 18 can be found in the telephonic interview held with the Examiner on April 5, 2007 where the Examiner stated that “the language in the specification (referring to page 8, lines 18 to 20) supports the use of the phrases ‘means for positioning,’ a ‘positioning device,’ or a ‘positioning apparatus,’ ” and where the Examiner further stated that “using a positioning device is an acceptable meaning of the disclosure.” Further support for new Claims 17 and 18 can be found in the previously submitted communication filed on May 11, 2007 (referring to pages 10
25 and 11) and on page 6 lines 18-19 of the specification, and in figures 1 and 2.
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As previously stated on the communication filed on May 11, 2007 and repeated here for clarity, the Applicants submit that support for new Claims 17 and 18 can be found on the present invention page 8 lines 18-21, where the specification states that “with appropriate 5 positioning from the plasma source exit (referring to element 102 in Figures 1 and 2), the diamond surface(s) (referring to element 130 in Figures 1 and 2) may be completely covered by the atomic oxygen plasma plume (referring to element 204 in Figure 2).” The Applicants further submit that the present invention also teaches that the diamond sample, or samples, of interest are placed beyond the plasma source exit (referring to present 10 invention page 6 lines 18-19), which is language in the specification that supports the use of “means for placing,” a “placing device,” or a “placing apparatus,” which are analogous to the “positioning device for allowing a user to position at least one diamond sample in the path of the oxygen plasma exiting through the plasma source exit,” as claimed in Claims 17 and 18.

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Furthermore, the Applicants submit that these new Claims 17 and 18 are patentable over the cited prior art.

I. All elements are not suggested by the reference teachings.

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The cited prior art does not establish a *prima facie* case of obviousness

In order to establish a *prima facie* case of obviousness, the Examiner must set forth an argument that provides (1) one or more references (2) that were available to the inventor and (3) that teach (4) a suggestion to combine or modify the references, (5) the 25 combination or modification of which would appear to be sufficient to have made the claimed invention obvious to one of ordinary skill in the art. Importantly, the teaching or suggestion to make the claimed combination must be found in the prior art, not in the Applicant’s disclosure. *In re Vaeck*, 947 F.2d 4888, 20 USPQ2d 1438 (Fed. Cir. 1991). Further, the CCPA has subsequently added that the *prima facie* case requires that the

reference teachings “appear to have suggested the claimed subject matter.” *In re Rinehart*, 531 F.2d 1048 (C.C.P.A. 1976).

The Applicants believe that the Examiner has failed to properly cite and establish references that, if combined, teach each of the structural elements of the claimed invention. More specifically, the cited prior art fails to teach the structural element of “a positioning device” (emphasis added) for allowing a user to position at least one diamond sample in the path of the oxygen plasma exiting through the plasma source exit,” as recited in dependent Claims 17 and 18 of the present invention.

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Regarding the Examiner’s rejection of the limitation of “a positioning device”

The Applicants submit that the Examiner vaguely implied that the newly introduced art of the Collins and Brailove patents discloses the recently added limitation of “a positioning device for allowing a user to position at least one diamond sample in the path of the oxygen plasma exiting through the plasma source exit,” wherein this limitation is currently amended out of independent Claims 1 and 7 and reintroduced into new dependent Claims 17 and 18. More specifically, the Applicants submit that the Examiner vaguely stated that “the Collins patent (referring to Fig. 3, for example) and the Brailove patent (referring to Figs. 1 and 5, for example) have been added to the rejection to show that a plasma treating apparatus having a plasma source for treating a work-piece sample requires a positioning device for allowing a user to position the sample in the path of plasma that exits the plasma source” (referring to the bottom paragraph of page 3 of the current Office Action). Then, the Examiner concluded that it would have been obvious to one skilled in the art to provide a sample holder for the plasma treating apparatus of the Leung I patent, in the manner illustrated by the Collins or Brailove patents because a sample positioning device is required to successfully treat a work-piece as desired by the Leung I patent.

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The Applicants submit that the Examiner only referred to the figures on the prior art as a whole (referring to the paragraph above and to Figure 3 of the Collins patent,

and Figures 1 and 5 of the Brailove patent) without singling out exactly which elements within these figures the Examiner is considering to be equivalent to the “positioning device” disclosed by the present invention.

The Applicants refer the Examiner to these three cited figures (referring to Figure 3 of the Collins patent, and Figures 1 and 5 of the

5 Brailove patent) which contain a plurality of elements, and wherein not one of the

elements present in any of these three figures is labeled or referred to as a

“positioning device” or a “sample holder” (as submitted by the Examiner on the

bottom paragraph of page 3 of the current Office Action dated August 10, 2007).

Furthermore, the Applicants respectfully submit that the Examiner did not cite

10 properly in which column and line numbers the Examiner exactly found the

description of the alleged positioning devices taught by the Collins and Brailove

patents.

In addition, the Applicants believe that the Examiner seems to be mistakenly equating the

15 “end sectional view of the ion source” (illustrated in figure 5 of the Brailove patent) with

a “positioning device.” The Applicants emphasize that this sectional view only displays

several arrays of bar magnets (referring to element 74 on Figure 5), parallel elongated

magnets (referring to elements 90a to 90n on Figure 5), and an ion beam (referring to

element 84 on Figure 5), and that this sectional view does not include a positioning

20 device of any kind. Therefore, the Applicants assert that figure 5 of the Brailove

patent absolutely does not describe and does not illustrate a “positioning device” or

a structure equivalent to a “positioning device in the path of the oxygen plasma”

(wherein the oxygen plasma is illustrated by element 84 on Figure 5), as previously

suggested by the Examiner.

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Therefore, the Applicants kindly request that the Examiner please indicate exactly

which elements in these three figures the Examiner considers to be a “positioning

device” or a “sample holder,” and that the Examiner please provide us with the

exact column number and line numbers (on the Collins patent and on the Brailove

30 patent) where these cited element are described to be structurally equivalent to a

“positioning device for allowing a user to position at least one diamond sample in the path of the oxygen plasma exiting through the plasma source exit,” as recited in new dependent Claims 17 and 18 of the present invention.

5 **Claims 6 and 14**

The Examiner rejected dependent Claims 6 and 14 as being obvious over the Leung-I patent, in view of the Kaufman patent, and further in view of the Leung II patent, and taken in further view of the Collins patent or the Brailove patent. However, upon reviewing the Leung-I, Leung-II, and Kaufman patents, the Applicants believe that the 10 combination of the Leung-I patent with the Leung-II patent, the Kaufman patent, and the Collins patent or the Brailove patent does not disclose each element disclosed by the dependent Claims 6 and 14.

I. **All elements are not suggested by the reference teachings.**

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The cited prior art does not establish a prima facie case of obviousness

In order to establish a *prima facie* case of obviousness, the Examiner must set forth an argument that provides (1) one or more references (2) that were available to the inventor and (3) that teach (4) a suggestion to combine or modify the references, (5) the 20 combination or modification of which would appear to be sufficient to have made the claimed invention obvious to one of ordinary skill in the art. Importantly, the teaching or suggestion to make the claimed combination must be found in the prior art, not in the Applicant's disclosure. *In re Vaeck*, 947 F.2d 4888, 20 USPQ2d 1438 (Fed. Cir. 1991). Further, the CCPA has subsequently added that the *prima facie* case requires that the 25 reference teachings “appear to have suggested the claimed subject matter.” *In re Rinehart*, 531 F.2d 1048 (C.C.P.A. 1976).

The Applicants believe that the Examiner has mistakenly stated that the Leung I patent teaches the limitation of “a pressure of between 6.0×10^{-5} and 30 1.2×10^{-4} Torr” (emphasis added), and that the Examiner has failed to establish

references that, if combined, teach each of the structural elements of Claims 6 and 14. More specifically, the cited prior art fails to teach “a pressure of oxygen gas introduced into the plasma generation reaction chamber is between 6.0×10^{-5} and 1.2×10^{-4} Torr.”

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Previously (referring to the Office Action dated December 6, 2006), the Examiner stated that the “limitation of a pressure between 6.0×10^{-5} and 1.2×10^{-4} Torr is taught by the Leung I patent (referring to column 5, lines 40-45) where the Leung I patent teaches that the vacuum pump of his apparatus is capable of operating in the 3×10^{-4} Torr.

10 pressure range.” Then, the Examiner concluded that it would be expected that the apparatus taught by the Leung I patent would be capable of also operating at 1.2×10^{-4} torr. The Examiner further stated, once again, that a recitation of intended use does not require an apparatus to be operated in the recited manner, but only requires that the apparatus have an inherent capability of being operated according to the recited manner.

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The Leung I patent clearly teaches that “his apparatus is capable of operating in the 3×10^{-4} Torr pressure range” as stated by the Examiner on the paragraph above, thus the Applicants believe that the 3×10^{-4} Torr pressure of the Leung I patent is outside the pressure range disclosed by the present invention. The Applicants assert that the 3×10^{-4} Torr pressure is higher than the upper limit (referring to 1.2×10^{-4} Torr) of the pressure range (referring to pressure of oxygen gas introduced into the plasma generation reaction chamber is between 6.0×10^{-5} and 1.2×10^{-4} Torr) disclosed in Claims 6 and 14. Clearly, a 3×10^{-4} Torr pressure is higher than a 1.2×10^{-4} Torr pressure (emphasis added). Thus, there is nothing in the Leung I patent that teaches that the device according to the Leung I patent is capable of being operated within the pressure ranges as required by the present invention.

25 Additionally, Claim 6 is dependent upon Claim 1 Claim 14 is dependent upon Claim 7. The Applicants respectfully refer the Examiner to the comments above regarding Claims 1 and 7. For at least the reasons given above, the Applicants submit that Claims 1 and 7

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are patentable over the cited prior art. In addition, Claims 6 and 14 include additional limitations (i.e., the pressure range) that further distinguish them from the reference cited.

Therefore, the Applicants submit that Claims 6 and 14 are also patentable over the cited prior art at least based on their dependence upon an allowable base claim. Thus, the

5 Applicants respectfully solicit reconsideration and allowance of these claims.

Dependent Claims

Claims 2-6 are dependent upon Claim 1, and Claims 8-14 are dependent upon

Claim 7. For at least the reasons given above, the Applicants submit that Claims

10 1 and 7 are patentable over the cited prior art. Therefore, the Applicants submit that Claims 2-6 and 8-14 are also patentable over the cited prior art, at least based on their dependence upon an allowable base claim. Thus, the Applicants respectfully request that the Examiner withdraw all rejections of Claims 2-6 and Claims 8-14 and provide for timely allowance of the claims.

Closing Remarks:

The Applicants respectfully submit that, in light of the above remarks, the application and all pending claims are now in allowable condition. Therefore, reconsideration is

5 respectfully requested. Accordingly, early allowance and issuance of this application is respectfully requested.

Any claim amendments that are not specifically discussed in the above remarks are not made for patentability purposes, and it is believed that the claims would satisfy the

10 statutory requirements for patentability without the entry of such amendments. Rather, these amendments have only been made to increase claim readability, to improve

grammar, and to reduce the time and effort required of those skilled in the art to clearly understand the scope of the claim language. Furthermore, any new claims presented

above are of course intended to avoid the prior art, but are not intended as replacements

15 or substitutes of any cancelled claims. They are simply additional specific statements of inventive concepts described in the application as originally filed.

Further, it should be noted that amendment(s) to any claim is intended to comply with the requirements of the Office Action in order to elicit an early allowance, and is not

20 intended to prejudice Applicants' rights or in any way to create an estoppel preventing Applicant from arguing allowability of the originally filed claim in further off-spring applications.

In the event the Examiner wishes to discuss any aspect of this response, or believes that a

25 conversation with either Applicant or Applicant's representative would be beneficial, the Examiner is encouraged to contact the undersigned at the telephone number indicated below.

The Commissioner is authorized to charge any additional fees that may be required or

30 credit overpayment to the attached credit card form. In particular, if this response is not timely filed, the Commissioner is authorized to treat this response as including a petition

Reply to Office Action of August 10, 2007

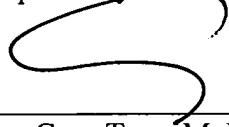
to extend the time period pursuant to 37 CFR 1.136(a) requesting an extension of time of the number of months necessary to make this response timely filed. The petition fee due in connection therewith may be charged to deposit account no. 50-2738 if a credit card form has not been included with this correspondence, or if the credit card could not be

5 charged.

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Date01/10/2008

Respectfully submitted,



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Attachments: Replacement Sheets